

### III. INDIAN LAND PLANARIANS.

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(With Plate XI.)

#### INTRODUCTION.

Until the present time the land planarians of India have been almost entirely neglected, while the Ceylon forms have been the subject of considerable attention; but it is hoped that the beginning thus made will develop into a comprehensive treatment of these animals which flourish abundantly in all parts where moisture is plentiful.

It was only to be expected that most of the collection would prove to be new; planarians, both land and freshwater, are strikingly local especially the latter; dry areas of any great extent prove complete barriers to their dispersal.

Previous records of Indian land planarians are rare, incomplete and uncertain. *Bipalium smithi* (v. Graff) is described, but with no figure, in von Graff's "Monographie der Turbellarien—Landplanarien" 1899 and references are made there also to some three or four others which, however, must be regarded as doubtful. Reference might be made to the so-called *Bipalium ferudpoorens* (E. P. Wright) and it is conjectured by Bell that Ferudpoor is a mis-spelling for Ferozpur in the Punjab; but this is most unlikely, since Ferozpur is in one of the driest and hottest parts of India, and scarcely a place likely to yield land planarians.

The following account is purely systematic, but it is hoped before long to begin anatomical details of the various forms, a work which will do much to clear up any doubtful points; for colour patterns are frequently variable, often due to the age of the specimens. At present it would be unsafe to make any general conclusions regarding distribution; what is known in each case is stated when dealing with each species.

#### *Bipalium proserpina* (Humbert).

(Plate XI, figs. 1 to 10.)

Indian Museum Collection Nos. ZEV  $\frac{27.68}{7}$ ; ZEV  $\frac{67.03}{7}$ ; ZEV  $\frac{67.07}{7}$ ; ZEV  $\frac{67.09}{7}$ ; ZEV  $\frac{67.10}{7}$ ; ZEV  $\frac{67.13}{7}$ ; ZEV  $\frac{67.14}{7}$ ; ZEV  $\frac{67.22}{7}$ .

This planarian was previously reported from Ceylon only, but its distribution is now found to be quite extensive in India, specimens having been taken at Tenmalai, Maddathoray (Travancore)

and Cochin in Southern India, North Bengal, Lebong and Kurseong in the Eastern Himalayas, Naini Tal in Kumaon, Western Himalayas as well as in Ceylon. The specimen from Lebong may be doubtful since it is headless, but the trunk markings are characteristic of *B. proserpina*, and the doubt is lessened by the fact that the planarian fauna of the Eastern Himalayas is known to include this species. Thus *B. proserpina* will probably prove to be one of the most widely distributed land planarians in India.

The species has been fully described by v. Graff in his monograph and repetition is unnecessary; however, an interesting feature of those collected is the extent of the variation of the colour pattern apart from the mere differences of shade. The typical colouration exhibits a pair of closely approximated central black stripes, which on the head expand into a crescentic patch broken only by a middle club-shaped extension of the thin pale stripe which separates the median black lines; and a prominent black band extending from the 'neck' and following the edge of the trunk to the extremity (fig. 1).

The variations involve such changes in the typical pattern as follow:

The median lines may coalesce into a single broad band; associated with this, the central club-shaped expansion on the head remains, though it may be reduced (fig. 2).

The same two lines may be quite faintly shown, and indicated only as broken lines; with this variation, the head pattern remains characteristic (fig. 3).

The median lines may be absent, and in this case the dark crescentic head patch appears as an unbroken tract (fig. 4).

In some cases the median stripes may be more strongly marked than the laterals (fig. 5).

The lateral bands may vary in breadth and usually are stronger when the median ones are weaker; and vice versa.

The lateral bands may be split along their whole length to form a pair on each side (fig. 6).

As regards the head pattern, the crescentic patch may be only faintly indicated (figs. 7, 8); and in one specimen with coalesced central lines, a forked design is produced, owing to the median lighter piece opening out anteriorly (fig. 9).

### *Pelmatoplanea sarasinorum* (v. Graff).

(Plate XI, figs. 11 and 12.)

Indian Museum Collection No. ZEV 6699.

Dr. Gravely records that a specimen of this animal from Ceylon was very dark above and paler beneath, with a dark mid-dorsal line. The preservative has doubtless removed some pigment and has also caused strong contraction of the body so that the dorsal surface has become concave; this latter feature is, however, undoubtedly not natural, the animal, in life, being practically cylindrical.

Its characters agree closely with v. Graff's specimens collected by M. Sarasin in 1883 in Ceylon. It is only half the size of the largest of those described by v. Graff, measuring about 36 mm. in length, and is unfortunately broken into two pieces. The upper side is brownish with a paler area along each side of the mid-dorsal line; the characteristically narrow ambulacral surface extends to the extreme anterior end round which are the fairly numerous eyes.

***Bipalium smithi* (v. Graff).**

(Plate XI, figs. 13 and 14.)

Indian Museum Collection Nos. ZEV  $\frac{667.5}{7}$ ; ZEV  $\frac{67.01}{7}$ ; W  $\frac{9.3}{1}$ ; W  $\frac{9.1}{1}$ .

Historically, the most interesting land planarian collected in India is *B. smithi*, since it was the first described from this country with any degree of certainty. The other few mentioned previous to 1914 were all vaguely described, and the accounts are practically useless. However, though he did not figure *B. smithi*, v. Graff describes it in his monograph and I have myself examined the specimen in the British Museum.

The species has, I believe, been found at least four times since; in its original home by Lord Carmichael and Dr. Gravely at Darjiling, and once by Major Bennett at Lebong in the same district.

The British Museum specimen measures 60 mm. in length, but the specimens found since are somewhat smaller; the measurements of the largest complete specimen are:—

Length of the body	..	..	45 mm.
Breadth of the body	..	..	6 mm.
Breadth of the head lobe	..	..	7 mm.
Breadth of the ambulacral surface	..	..	2 mm.
Thickness of the body	..	..	3 mm.
Position of the mouth from the anterior end	..	..	24 mm.
Position of the genital opening from the anterior end	..	..	36 mm.

The specimen from Lebong is much larger, though incomplete, and is probably longer than the British Museum specimen.

The dorsal colour is variable; the deeper layers of the skin contain a bluish-black pigment which is usually masked by a brown colour on the surface closely resembling a mucus, and which is undoubtedly more pronounced in spirit preserved specimens. Thus there may be a predominance of one or the other of these colours and frequently a somewhat patchy appearance is shown. The best preserved specimen is distinctly dark, mostly bluish-black, but paler on the head. The eyes form a diffuse black rim to the edge of the head lobe.

Ventrally, the colour is definitely characteristic; it is light brown except for the ambulacral surface which, along the centre, is creamish brown, while each side has a bluish-green tinge.

***Bipalium floweri* (v. Graff).**

(Plate XI, figs. 15 and 16).

Indian Museum Collection Nos. ZEV  $\frac{66.7.7}{7}$ ; ZEV  $\frac{67.0.1}{7}$ ; ZEV  $\frac{67.0.5}{7}$ .

This is one of the larger land planarians of Ceylon; it was first collected by Mr. E. E. Green at Punduloya, Rambodda, and the specimen is now in the British Museum.

It has again been found by Dr. Gravely in Pattipola and on the Horton Plains at an altitude of 7,000 ft. One of the Pattipola specimens is the largest yet collected, being 78 mm. long and 8 mm. broad.

The dorsal head pattern is characteristic; a prominent black band follows the periphery of the head lobe and parallel to this band is an orange stripe, which in turn is followed by another dark band which passes gradually into the dark brown colour of the trunk; the trunk colouring lacks pattern and is an even dark muddy brown.

Ventrally, the general surface is somewhat paler than the dorsal side, especially on the head; the latter has a thin dark line at the extreme edge terminating at the angle of the lappets. The ambulacral surface is cream coloured and at the anterior end its raised central portion is a distinct light brown.

***Dolichoplana feildeni* (v. Graff).**

(Plate XI, figs. 17 and 18.)

Indian Museum Collection No. ZEV  $\frac{67.1.1}{7}$ .

This species is most interesting from the fact that it is an exception to the general rule that land planarians are local in distribution, having been taken in Java, Ceylon and the Barbadoes. As v. Graff remarks, except for *Placocephalus kewensis*, which is cosmopolitan, it is the only land planarian that is found in the Oriental and Neotropical regions. It was previously recorded from Ceylon having been collected by Mr. E. E. Green and preserved in the British Museum.

The Indian Museum specimens, collected by Dr. Gravely, were taken at Peradeniya, Ceylon, in June 1910; they are about the same size as Green's specimens, measuring about 47 mm. in length and 3 mm. broad; the Javanese specimens are said to attain even a length of 300 mm. in the living condition, though the same individuals shrink to 77 mm. when preserved. It is therefore safe to assume that the Ceylon forms are capable of an extension to 150 mm. The species is described as being extremely active, exhibiting excessive contractions in its movements.

There is some variety in the general colour; the Javanese type is said to be yellowish while those from Ceylon are, at least in the preserved state, dark brown, though in life the same animal may be distinctly light coloured. Six longitudinal black stripes are distinguishable; a pair of median lines, very closely approxi-

mated and very fine; and two pairs of lateral stripes, the inner pair of which are much the strongest of all. Ventrally, the brown colour is continued from the dorsal side, except for the ambulacral surface which is grey; in light coloured varieties this contrasts with the general surface as darker, but where the brown pigment is marked, the ambulacral surface appears lighter in contrast.

***Bipalium diana* (Humbert).**

(Plate XI, figs. 19 and 20).

Indian Museum Collection No. ZEV  $\frac{671}{7}2$ .

Three specimens of this species, one only of which is complete, were collected by Dr. Gravely at Peradeniya, Ceylon. They are typical forms corresponding exactly with those already recorded from the same and other localities in Ceylon by a number of observers.

Dorsally, it is brownish-grey with mottlings of black; a closely approximated median pair of black lines runs the whole length of the body, expanding on the head to a crescentic marking; the pale stripe of ground colour between the median lines swells out to a club-shaped form on the middle of the head. The extreme edge of the head lobe is black with numerous eyes and the band between them and the black patch is devoid of mottling.

On the ventral side, the colour is grey with a cream ambulacral surface having a light brown centre.

The species is easy to recognize in older specimens, though in the young forms it is said to have lateral dark bands along the body, which are lost in older animals.

***Bipalium giganteum* (Whitehouse).**

Indian Museum Collection No. ZEV  $\frac{6687}{7}$ .

Previously recorded from Dibrugarh, Assam, this species was again taken in N.E. Assam at Tezporé by Major T. E. Spragge White. The tube contained three broken pieces of a specimen which is however still incomplete.

***Bipalium andrewesi*, n. sp.**

(Plate XI, figs. 21 and 22.)

Indian Museum Collection No. ZEV  $\frac{6690}{7}$ .

Only a single specimen of this attractive planarian was taken by Mr. Andrewes on the western slopes of the Nilgiri Hills at an altitude of 2000-3000 ft. in August 1911. In build, the animal is small and sturdy with a comparatively small head lobe. Its measurements are as follows:—

Length of the body	..	..	10 mm.
Breadth of the body	..	..	3 mm.
Breadth of the head lobe	..	..	4 mm.
Breadth of the ambulacral surface	..	..	1 mm.



Position of the mouth from anterior  
 end           ..           ..           ..       6 mm.  
 Position of the genital opening not distinguishable.

The general ground colour of the dorsal side is a dark reddish-brown, though the markings upon it cover the greater part of the surface. Three longitudinal black stripes run from the 'neck' to the posterior extremity, a median broad band and a pair of less broad laterals at the edge of the body; all unite at the 'neck' in a narrow black transverse band. The head is slightly paler than the brown of the trunk, with a crescentic black band, which normally is probably continuous across the head, though in the specimen examined it is interrupted on the left side. The eyes are arranged along the extreme edge of the head lobe.

Ventrally, the animal is a dull drab brown, with a darker shade at the outer edge and also next to the ambulacral surface; this latter is very pale with a darker central stripe. The under side of the head is paler than the other parts and has a dark crescentic band corresponding to the black mark above.

***Cotyloplana nilgiriense*, n. sp.**

(Plate XI, fig. 23).

Indian Museum Collection No. ZEV  $\frac{6690}{7}$  B.

This is the second member of the genus to be found in India, and was taken in the Nilgiri Hills along with *Bipalium andrewesi*. The measurements of the larger of the two specimens are:—

Length of the body       ..           (about) 12 mm.  
 Breadth of the body     ..           ..       3 mm.  
 Position of the mouth from anterior  
 end           ..           ..           ..       6 mm.  
 Position of the genital aperture from  
 the anterior end       ..           ..       9 mm.  
 Breadth of the ambulacral surface  
                   ..           ..           (about) 5 mm.

Above and below the creature is of a greyish colour with touches of brown in parts; dorsally there is a single median black line passing from one extremity to the other and tapering suddenly at the head, which is somewhat lighter in colour. Round the anterior extremity of the ventral surface of the head is a slightly raised and fairly thick "lip," forming a type of sucker characteristic of the genus. The ambulacral surface is very narrow, appearing only as a pale line along the ventral side.

***Bipalium brunneus*, n. sp.**

(Plate XI, figs. 24-26.)

Indian Museum Collection Nos. ZEV  $\frac{6671}{7}$ ; ZEV  $\frac{6690}{7}$ .

This handsome planarian was collected at Bagarkote in Kumaon in the Western Himalayas, and in the Cochin State,

S. India; it must therefore have a wide distribution in India and will probably be found in many other districts eventually.

The following description refers in particular to No. ZEV <sup>667.1</sup>/<sub>7</sub> from Bagarkote at an altitude of 3,000 ft. which is the largest specimen.

Length of the body	..	..	58 mm.
Greatest breadth of the body	..	..	9 mm.
Thickness of the body	..	..	3 mm.
Breadth of the head lobe	..	..	6 mm.
Breadth of the ambulacral surface	..	..	3 mm.
Position of mouth from the anterior end	..	..	24 mm.
Position of the genital opening from the anterior end	..	..	33 mm.

The ground colour of the dorsal surface is a warm rusty brown with three longitudinal dark stripes, a median and a pair of laterals. The median stripe is prominent and jet black, extending from the extreme anterior to the posterior extremity, and widening slightly above the pharyngeal and genital regions. The lateral stripes are of diffuse black pigment and broader than the median, extending from the 'neck' to the posterior end of the body. The eyes are closely packed to form a thin jet black line round the edge of the head lobe; they are also found distributed generally over the head region.

The ventral surface, except for the creeping area, is a dull rusty brown with a greyish outer edge along the whole length but not sharply marked off from the brown. The ambulacral surface is purplish-grey, the middle being raised into a ridge; the mouth and genital openings are prominent and from them respectively protrude the frilled pharynx and genital organ.

The other specimen differs in minor particulars.

No. ZEV <sup>669.5</sup>/<sub>7</sub> from near the Forest Tramway in Cochin State at an altitude of 300 ft. is 17 mm. long and its dorsal colouring is of the same pattern as that of the specimen described above, with the following exceptions: The lateral bands are jet black and not diffused; the median line ends in a club-shaped expansion on the head, which is otherwise pale. These differences are such as may be met with in young specimens; it is characteristic of land planarians that stripes tend to disappear with age, a feature constantly illustrated in the case of *Bipalium diana*.

### ***Pelmatoplana rotunda*, n. sp.**

(Plate XI, fig. 27).

Indian Museum Collection No. ZEV <sup>667.1</sup>/<sub>7</sub> B.

One specimen of this Geoplanid was procured along with *Bipalium brunneus* at Bagarkote in Kumaon, Western Himalayas, at an altitude of 3,000 ft., in June 1914.

The animal is small and very blunt at each end; in transverse section it is almost circular. Its measurements are:—

Length of the body	..	..	15 mm.
Breadth of the body	..	..	3.5 mm.
Thickness of the body	..	..	3 mm.
Breadth of the ambulacral surface	..	..	1 mm.
Position of the mouth from anterior end	..	..	7 mm.
Position of genital opening from anterior end	..	..	11 mm.

The dorsal coloration is an even moderately light brown covering a deeper black pigment. The ventral surface is slightly darker except for the very prominent ambulacral surface, which is white with a fairly dark median line, and which extends from one extremity to the other. The eyes could not be distinguished with certainty, though on one side there is a somewhat paler circular patch in the middle of which one of a pair of eyes may be situated.

### ***Bipalium splendens*, n. sp.**

(Plate XI, figs 29-31.)

Indian Museum Collection No. ZEV  $\frac{6692}{7}$ ; ZEV  $\frac{6716}{7}$ .

This beautiful planarian is found at Kurseong in the Eastern Himalayas and Cherrapungi in Assam; the measurements of the larger specimen are as follows:—

Length of the body	..	..	90 mm.
Breadth of the body	..	..	4.5 mm.
Breadth of the head lobe	..	..	3 mm.
Breadth of the ambulacral surface	..	..	1 mm.
Position of the mouth from anterior end	..	..	45 mm.
Position of genital aperture from anterior end	..	..	54 mm.

The upper surface is flat while the lower is slightly arched; the head is flat and small being only a little wider than the 'neck' and narrower than the greater part of the trunk, the body tapers gradually towards the posterior end. Judging from the wrinkling of the body in the preserved animal, it would appear capable of considerably greater extension in life.

The colour pattern on the upper side of the trunk consists of three longitudinal jet black lines, one median, and a pair of laterals, at the extreme edge of the body, on a ground colour which differs in the two specimens, in one a creamish yellow and in the other chestnut brown; at the pharyngeal region the median line widens to double its ordinary width, and a slight thickening also occurs over the genital region. The lateral lines, narrower than the median, cease at the 'neck,' while the median one expands into a knob-like termination on the head. The whole of the upper side of the head has a deeper shade than the rest of the body



The eyes are not numerous and are placed round the edge of the head lobe rather more to the ventral side.

Ventrally, the ground colour is similar to that of the dorsal side; the ambulacral surface is pale yellow, and on each side of it is a diffused black line, extending from the 'neck' to the extreme posterior, the under side of the head is a little darker towards the outer edge.

***Pelmatoplanea himalayense*, n. sp.**

(Plate XI, figs. 32-34).

Indian Museum Collection No. ZEV  $\frac{67.3.9}{7}$ ; ZEV  $\frac{66.6.7}{7}$ ; ZEV  $\frac{66.9.4}{7}$ ; ZEV  $\frac{67.1.5}{7}$ ; ZEV  $\frac{67.1.7}{7}$ .

This species is represented by three specimens, only one of which, collected by Dr. F. H. Gravely, is well preserved; the other two were the first to be found, on 15th July 1907, at Kurseong, E. Himalayas, while Dr. Gravely's specimen was taken in the same district between Darjiling and Soom on 14th June 1914. All were taken at an altitude of 5,000-7,000 ft.

The animal is a comparatively fragile creature, beautifully marked in black and brown stripes and of the usual Geoplanid form. The measurements are approximations only, since the animal is much coiled and liable to break if uncoiling were attempted.

Length of body .. .. 123 mm.

Breadth of body .. .. 4 mm.

Breadth of ambulacral surface .. .. 1 mm.

Position of the mouth, about half-way along the body.

Position of the genital opening, from mid-way to two-thirds the distance from the mouth to the posterior extremity.

The colour pattern consists of five jet black longitudinal bands alternate with four narrow stripes of a median brown colour; of the black bands, the median is the broadest, the inner lateral somewhat narrower, while the outer lateral, at the edge of the body, is but a thin line. All the brown stripes are of similar width. As the anterior end is reached, the black bands gradually acquire a more or less equal strength and end abruptly and evenly at the posterior border of a brown collar encircling the neck region. From the collar forwards the head is of a dark grey colour, sufficiently dark as to make it impossible to distinguish the presence or absence of eyes.

Ventrally, the colour is similar to the brown of the dorsal side, except for the ambulacral surface, which is white and slightly protuberant.

***Bipalium sylvestre*, n. sp.**

(Plate XI, fig. 35 and 36).

Indian Museum Collection No. ZEV  $\frac{66.9.5}{7}$ B.

This planarian, of which one specimen only was taken in the Cochin State near the Forest Tramway, is a very dark form and

only at the anterior portion can the markings be followed. The measurements are:—

Length of the body	..	..	50 mm.
Breadth of the body	..	..	5 mm.
Breadth of the head lobe	..	..	6 mm.
Breadth of the ambulacral surface	..	..	2 mm.
Position of the mouth from anterior end	..	..	28 mm.
Position of the genital opening not visible.			

The colour of the dorsal surface is a very dark brown; three longitudinal black lines are present, a median thin line reaching to the 'neck' and a pair of broader lateral lines at the edge of the body. These laterals are continued round the contour of the head a little removed from the edge and thickest near the lappets. On the head and alongside the lateral bands is a black mottling.

Ventrally, the colour is a warm brown at the outer edge, gradually becoming paler as the ambulacral surface is reached; the latter is pale with a brown central line throughout its length, and it ends abruptly at the 'neck.' The under side of the head is darker than the rest of the ventral surface.

*Pelmatoplane maculosa*, n. sp.

(Plate XI, figs. 37 and 38).

Indian Museum Collection No. ZEV  $\frac{67.0.5}{7}$  B.

One specimen only of this planarian was found by Dr. Gravely at Pattipola, Ceylon. Its measurements are:—

Length of the body	..	..	45 mm.
Breadth of the body	..	..	5 mm.
Breadth of ambulacral surface, about	..	..	75 mm.
Position of mouth from anterior end	..	..	23 mm.
Position of genital opening from anterior end	..	..	31 mm.

The ground colour of both the dorsal and ventral sides must, strictly speaking, be regarded as a warm brown with heavy black mottlings on the dorsal surface. The mottling, however, is so dense as to make the dorsal colouring more easily described as black with irregular small brown splashes; these markings are dendritic, with a tendency to parallel arrangement with numerous cross connections. Extending from one extremity to the other is a median thin brown line, that is, a narrow portion of the ground colour uninterrupted by black pigment. The black marking is practically continuous on each side of the median stripe and also at each side of the body where the colouring of the dorsal and ventral surfaces is sharply marked off. No eyes can be distinguished.

The ambulacral surface is pale and narrow, about one-fifth the width of the body, extending to both extremities; it is grooved throughout its length, with a darker pigment at the bottom of the

groove, though it is difficult to say how much this may be due to the effect of the preservative.

***PeImatoplana striata*, n. sp.**

(Plate XI, figs. 39-41).

Indian Museum Collection No. ZEV  $\frac{67.09}{7}$ B.

Two specimens of this planarian were taken by Dr. Annandale at Maddathoray in Travancore from beneath rotten wood in the jungle in October 1908; both specimens are of about equal size, measuring 42 mm. in length and 5 mm. in breadth; the ambulacral surface is very narrow being less than a millimetre broad. Neither the mouth nor the genital opening can be seen probably owing to the fact that there is a groove running along the middle of the ambulacral area, and the apertures being situated at the bottom are invisible. However, the pharyngeal swelling, 20 mm. from the anterior end, would place the mouth at about half way along the ventral side, with the genital opening not far away. No eyes can be distinguished.

The general colour is a rather pale grey brown; six longitudinal dark stripes run from end to end; (1) a pair of closely approximated lines separated only by an extremely thin pale line; they are jet black and prominent; (2) an inner lateral, and (3) an outer lateral line on each side of equal strength and not much darker than the ground colour. Between the middle pair and the inner laterals is a pale creamy white area. Ventrally the colour is similar to the general colour of the dorsal side, except for the pale narrow ambulacral surface, which extends to both extremities.

***Bipalium indica*, n. sp.**

(Plate XI, figs. 42 and 43.)

Indian Museum Collection Nos. ZEV  $\frac{66.62}{7}$ ; ZEV  $\frac{66.63}{7}$ ; ZEV  $\frac{67.05}{7}$ ; ZEV  $\frac{67.18}{7}$ ; ZEV  $\frac{72.31}{7}$ .

This planarian has been found in Calcutta and at Coimbatore in Southern India; it appears to be the commonest land planarian in the Calcutta district, and it will no doubt be found to have a somewhat extensive distribution in this country.

From the number of specimens collected, the length of the body may be put down as from 30 mm. to 40 mm. and the breadth from 3 mm. to 5 mm.; the head lobe is a little wider than the trunk; the mouth is situated about half the distance along the body, and the genital opening roughly half way between the mouth and the posterior extremity.

The dorsal colouration varies in different animals and in different parts of the same animal from a pale biscuit brown to a darkish dull brown; sometimes the body is distinctly patchy but usually the colour is even. There is an indication of a median pale stripe, but it is usually no more than an indication, except in

dark specimens, since it becomes lost in the general colour ; at the ' neck ' however it is always well marked owing to the presence in this region of dark pigment in the form of an indefinite band with which the median stripe contrasts strongly. The dorsal side of the head is pale and numerous eyes can easily be distinguished along the edge ; the eyes are also crowded at the ' neck.'

Ventrally, the colour is similar to the dorsal side, though usually paler ; the ambulacral surface is white